IN THE CLAIMS

Please cancel claims 5, 7, 10 and 60 without prejudice or disclaimer. Amend claim 8 and 58.

Please add claims 86-88. A complete claim listing is shown below:

1-7. (Canceled)

8. (Currently Amended) Microchannel apparatus comprising a connection between at least two microchannels, wherein the connection has a metal internal surface that has been coated with a vapor-deposited buffer layer comprising a metal oxide, wherein the buffer layer has a thickness of between 0.05 μm and 10 μm.

9. (Original) The microchannel apparatus of claim 8 further comprising an interfacial layer disposed on the buffer layer.

10. (canceled)

11. (Previously Presented) The microchannel apparatus of claim 8, wherein said microchannels each comprise at least one metallic wall and wherein said at least one metallic wall of each of the at least two microchannels has been coated with a buffer layer comprising a metal oxide.

12-45. (Canceled)

46. (Previously Presented) A method of making microchannel apparatus comprising:

providing a microchannel apparatus comprising a first layer and a second layer wherein each of said first and second layers comprises at least one microchannel, and,

subsequently, vapor depositing a buffer layer on at least one interior wall of a microchannel in each of said first and second layers in said microchannel apparatus.

47. (Previously Presented) A microchannel apparatus made by the method of claim 46 wherein the buffer layer comprises a metal oxide layer.

48. (Previously Presented) The microchannel apparatus of claim 47 wherein the metal oxide layer has a thickness of between 0.05 μm and 10 μm.

49. (Previously Presented) The method of claim 46 further comprising a step of depositing an interfacial layer on said buffer layer in each of said microchannels in each of said first and second layers.

50. (Previously Presented) The method of claim 49 further comprising a step of depositing a catalytically active material in each of said microchannels in each of said first and second layers, either after or simultaneous with said step of depositing an interfacial layer.

51. (Previously Presented) Microchannel apparatus made by the method of claim 50 further comprising a first heat exchanger adjacent to and in thermal contact with the first layer and a second heat exchanger adjacent to and in thermal contact with the second layer.

52. (Previously Presented) The microchannel apparatus of claim 51 wherein the at least one microchannel in the first layer has at least one dimension of 1 mm or less; and

wherein the at least one microchannel in the second layer has at least one dimension of 1 mm or less.

53. (Previously Presented) The microchannel apparatus of claim 52 wherein the first heat exchanger has a thickness of 250 microns to 3 mm; and wherein the second heat exchanger has a thickness of 250 microns to 3 mm.

54. (Previously Presented) The method of claim 46 wherein the step of providing a microchannel apparatus, comprises:

forming a subassembly by stacking at least one inner thin metal sheet in alternating contact with at least one outer metal thin sheet; wherein the at least one inner thin metal sheet comprises a solid margin around a circumference;

wherein the solid margin defines at least one longitudinal wall of a microchannel in the first layer; and

bonding the subassembly.

55. (Previously Presented) The method of claim 54 wherein the microchannel in the first layer has at least one dimension of 1 mm or less.

56. (Previously Presented) The method of claim 46 wherein the first layer comprises plural microchannels that are connected via a header.

57. (Previously Presented) The method of claim 46 wherein the microchannel apparatus is a laminated microchannel apparatus formed from an assembly of laminae; wherein the first layer is formed from a first laminae and the second layer is formed from a second laminae; and

wherein the step of vapor depositing comprises chemical vapor depositing.

58. (currently amended) The method ~~microchannel apparatus~~ of claim 46 wherein a connection connects the at least one microchannel in the first layer with the at least one microchannel in the second layer.

59. (Previously Presented) The microchannel apparatus of claim 51 wherein a connection connects the at least one microchannel in the first layer with the at least one microchannel in the second layer.

60. (canceled)

61. (Previously Presented) The microchannel apparatus of claim 51 wherein the buffer layer contains at least two compositionally different sublayers.

62. (Previously Presented) The microchannel apparatus of claim 48 further comprising an interfacial layer, and wherein the buffer layer is disposed between the interior wall of a microchannel and the interfacial and has a coefficient of thermal expansion that is intermediate the thermal expansion coefficients of the wall and the interfacial layer.

63. (Previously Presented) The microchannel apparatus of claim 48 wherein the buffer layer comprises Al_2O_3, TiO_2, ZrO_2, or combinations thereof; and

wherein the buffer layer is less than 5 microns thick.

64. (Previously Presented) The microchannel apparatus of claim 47 wherein the buffer layer is nonporous.

65. (Previously Presented) The microchannel apparatus of claim 48 wherein the interfacial layer has a thickness that ranges from 1 to 50 μm and has a BET surface area of at least 1 m^2/g.

66. (Previously Presented) The method of claim 46 wherein the step of vapor depositing comprises chemical vapor depositing conducted in a temperature range of 250 to 800 °C, and wherein the buffer layer comprises a metal oxide.

67. (Previously Presented) The microchannel apparatus of claim 48 further comprising an interfacial layer disposed over the buffer layer;

wherein the buffer layer and interfacial layer comprise a coating; and wherein the apparatus possesses thermal cycling stability such that, if exposed to 3 thermal cycles in air, the catalyst exhibits less than 2% flaking of the coating.

68. (Previously Presented) The method of claim 46 wherein the step of vapor depositing a buffer layer comprises the steps of: vapor depositing a TiO_2 layer; and vapor depositing a dense alumina layer over the TiO_2 layer; and further comprising a step of depositing an interfacial layer that comprises depositing a less dense, high surface area alumina layer over the dense alumina layer.

69. (Previously Presented) The microchannel apparatus of claim 8 wherein the buffer layer comprises a TiO_2 sublayer in contact with the metallic wall and a dense alpha alumina sublayer disposed over the TiO_2 sublayer.

70. (Previously Presented) The microchannel apparatus of claim 8 wherein the connection comprises a metal tube or a metal pipe.

71. (Previously Presented) The microchannel apparatus of claim 8 wherein the buffer layer comprises Al_2O_3, TiO_2, ZrO_2, or combinations thereof.

72. (Previously Presented) The microchannel apparatus of claim 70 wherein the buffer layer is less than 5 μm thick.

73. (Previously Presented) The microchannel apparatus of claim 8 wherein the connection is a header that is connected to the at least two microchannels.

74. (Previously Presented) The microchannel apparatus of claim 73 wherein the header and the at least two microchannels are disposed within the same plane.

75. (Previously Presented) A method of making microchannel apparatus, comprising:

providing a microchannel apparatus comprising a first layer and a second layer;

wherein the first layer comprises a first microchannel that is defined by at least one first microchannel metallic wall;

wherein the second layer comprises a second microchannel that is defined by at least one second microchannel metallic wall; and

a connection through a layer wherein the connection connects the first microchannel with the second microchannel; and, subsequently,

applying a buffer layer onto at least a portion of the at least one first microchannel wall, and at least a portion of the at least one second microchannel wall.

76. (Previously Presented) The method of claim 75 wherein the step of providing a microchannel apparatus comprises forming a laminated microchannel apparatus from an assembly of laminae; wherein the first layer is formed from a first laminae and the second layer is formed from a second laminae.

77. (Previously Presented) The method of claim 75 wherein the step of providing a microchannel apparatus, comprises:

forming a subassembly by stacking at least one inner thin metal sheet in alternating contact with at least one outer metal thin sheet; wherein the at least one inner thin metal sheet comprises a solid margin around a circumference;

wherein the solid margin defines at least one longitudinal wall of a microchannel in the first layer; and

bonding the subassembly.

78. (Previously Presented) The method of claim 77 wherein the microchannel in the first layer has at least one dimension of 1 mm or less.

79. (Previously Presented) The method of claim 75 further comprising a step of depositing an interfacial layer on said buffer layer.

80. (Previously Presented) The method of claim 79 further comprising a step of depositing a catalytically active material in each of said microchannels in each of said first and second layers, either after or simultaneous with said step of depositing an interfacial layer.

81. (Previously Presented) The method of claim 80 wherein the microchannel apparatus that is provided comprises a first heat exchanger adjacent to and in thermal contact with the first layer and a second heat exchanger adjacent to and in thermal contact with the second layer.

82. (Previously Presented) The method of claim 81 wherein the at least one microchannel in the first layer has at least one dimension of 1 mm or less; and

wherein the at least one microchannel in the second layer has at least one dimension of 1 mm or less.

83. (Previously Presented) The method of claim 82 wherein the first heat exchanger has a thickness of 250 microns to 3 mm; and wherein the second heat exchanger has a thickness of 250 microns to 3 mm.

84. (Previously Presented) The method of claim 75 wherein the at least one first microchannel metallic wall and at least one second microchannel metallic wall are chemically etched and then the buffer layer is deposited by chemical vapor deposition.

85. (Previously Presented) The method of claim 76 wherein the buffer layer is deposited by chemical vapor deposition and the buffer layer comprises a metal oxide.

86. (new) The method of claim 46 wherein a connection connects the at least one microchannel in the first layer with the at least one microchannel in the second layer; wherein the connection comprises interior surfaces, and comprising vapor depositing the buffer layer on interior surfaces of the connection.

87. (new) The method of claim 86 wherein the connection comprises a metal tube or a metal pipe.

88. (new) The method of claim 86 wherein the step of vapor depositing comprises chemical vapor depositing.